

**Remarks/Arguments:**

Claims 12-20, 22-26 and 29 are pending in the application. Claim 21 has been cancelled. Claim 29 is new and is supported by original claim 11 (prior claim 28). Claims 12 and 22 are currently amended. The amendments are supported throughout the original specification. For example, the amendments to claims 12 and 22 are supported at pg. 10, line 26 to pg. 11, line 4; pg. 12, lines 1-9; and original claim 7. No new matter has been added.

Applicant notes the absence of the Examiner's signature and date on the second page of the Information Disclosure Statement (filed March 19, 2009), which was initialed and apparently considered by the Examiner on April 17, 2009. Applicant respectfully requests consideration, signature, and date on the second page, if appropriate.

A declaration pursuant to 37 CFR §1.132 of Dr. Kassim Juma, an inventor of the subject application, is attached hereto.

**Rejections under 35 U.S.C. § 103**

Claims 12-21 stand rejected as obvious over U.S. Patent No. 5,690,161 (Daussan) in view of U.S. Patent No. 5,785,851 (Morris) and U.S. Patent No. 5,520,823 (Jones). Claims 22-26 stand rejected as obvious over Jones et al. in view of Daussan and Morris. Claims 12-21 stand rejected as obvious over Daussan in view of Morris and U.S. Publication No. 2007/0090047 (Bell et al.). Claims 22-26 stand rejected as obvious over the '047 Publication to Bell in view of Daussan and Morris. Applicant respectfully traverses these rejections and submits that the currently pending claims are patentable over these cited references for at least the reasons set forth below.

"To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. Additionally, as set forth by the Supreme Court in *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007), it is necessary to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

Independent claim 12 recites, in part, "Filter device for molten steel filtration made of a ceramic material comprising fibers and a carbon bonded network of graphitized carbon, the

graphitized carbon constituting the bonded network being present in an amount up to 15% by weight of the filter. . . .”

As explained in the specification, adding fibers to the filter significantly improves the performance of the filters, including increased mechanical strength, etc. Pg. 12, lines 1-14 of the specification. The addition of the fibers allows the amount of graphitized carbon to be reduced to a value of up to 15 wt % and still achieve a high stability of the filter during steel casting. Decl. para. 14.

**Rejections of Claims 12-21 over Daussan, Morris, and Jones**

Daussan, Morris, and Jones, alone or in any reasonable combination, do not teach each of the claimed limitations. Daussan describes a filter for molten metal comprising a protruding frame joining a plurality of sieve plates, the protruding frame and sieve plates defining a reservoir chamber. As recognized in the Office Action, Daussan fails to disclose a bonded network of graphitized carbon and does not teach that each plate includes a corrugated surface. Office Action pg. 2.

With respect to the addition of the limitation of “fibers” previously set forth in prior claim 21, the Office relies on Daussan for allegedly disclosing a filter material including reinforcing fibers. Office Action pg. 4. The refractory fibers in Daussan, however, are disposed in the cavities between the two refractory mineral plates.

In another embodiment of the invention **at least one of the cavities is filled with a filter material**. This filter material comprises refractory fibers, for example, and further increases the effectiveness of filtration. Col. 3, lines 41-44 of Daussan (emphasis added).

Also, as shown in FIGS. 8, 10 and 13 at least one of the cavities of the refractory material plates 2, 2i a, 2b is filled with a filter material 20, for example with refractory fibers. Col. 7, lines 15-17 of Daussan.

Daussan clearly discloses adding refractory fibers to the cavities between the two refractory mineral plates, and not to the two refractory mineral plates, e.g., not to the filters themselves. Accordingly, Daussan further does not teach a filter made of a ceramic material comprising fibers.

The Office relies on Jones for allegedly teaching a filter comprising a carbon bonded network of graphitized carbon, the graphitized carbon being present in an amount up to 15% by weight. Office Action pg. 2.

Jones is directed to a filter for filtering molten light metals formed from a composition comprising graphite, wollastonite, silicate, and borosilicate glass. The filters are manufactured (according to col. 2, lines 16-27 of Jones) by impregnating a large piece of reticulated organic foam with an aqueous slurry containing the graphite, wollastonite, silica, borosilicate glass, and one or more binders, which function during manufacturing, and optionally other components. The filter is characterized in that it consists of a crystalline phase comprising graphite and wollastonite dispersed in a substantially amorphous matrix of borosilicate glass. See col. 2, lines 10-16 of Jones.

The Office explains that the previous arguments were not persuasive because Jones allegedly teaches a graphitizable bonding precursor -- amorphous carbon, such as carbon black. Office Action pg. 10. Jones discloses that amorphous carbon, such as carbon black may be contained in the composition which is used to produce the filter in an amount of usually up to about 5 % by weight. See Jones at column 3, lines 13 to 19. As is explained in the declaration of Dr. Juma, however, it is clear to one skilled in the art that at the reaction conditions described by Jones, such amorphous carbon will **not** form a carbon bonded network of graphitized carbon as present in the filter as claimed. Decl. para. 20.

The Office also relies on Jones for the alleged proposition that the precursor is mixed with the ceramic powder and fired in a non-oxidizing atmosphere. Office Action pg. 10. The cited portion of the reference relied on clearly states:

When the impregnated organic foam is fired it is desirable that the firing temperature does not exceed 850 °C, unless special precautions are taken, otherwise **excessive oxidation** of the graphite, and amorphous carbon if present, will occur. Col. 3, lines 56-60 of Jones (emphasis added).

Jones does not disclose firing in a **non-oxidizing atmosphere**. It only warns of the possibility of excessive oxidation unless special precaution are taken. According to one skilled in the art, based on the information provided by Jones, it is clear that the impregnated organic foam is fired with access to oxygen such that carbon present in the impregnated foam is burnt off. Decl. para. 21. Under the reaction conditions described by Jones, a carbon bonded

network of graphitized carbon will not form due to the excess of borosilicate glass forming the substantially amorphous matrix and due to the presence of oxygen during firing. Decl. para. 24. Therefore, based on the disclosure of Jones, a carbon bonded network of graphitized carbon will not form.

Accordingly, although Jones discloses amorphous carbon, such as carbon black and warns against excessive oxidation, a person skilled in the art would recognize based on the disclosure of Jones that a carbon bonded network of graphitized carbon will not form. Thus, Jones does not remedy the deficiencies of Daussan.

With respect to the addition of the limitation of "fibers" previously set forth in prior claim 21, the filter disclosed by Jones may comprise fibers, e.g., wollastonite fibers (see Example 1, col. 4, line 33). The borosilicate glass used as a binder in the filter according to Jones, however, is completely different from the carbon bonded network of graphitized carbon used as a binder in the filter as claimed. Therefore, based on the information provided by Jones it could not be foreseen by one skilled in the art that by including fibers into the ceramic material a reduced amount of carbon bonded network of graphitized carbon of only up to 15% by weight would be sufficient to obtain a filter that is stable during steel casting.

Morris describes a reticulated ceramic filter having a corrugated inlet surface which comprises upper surfaces and lower surfaces to provide a substantial contact area for molten metal supplied to the inlet surface. The composition of the reticulated ceramic filter is not described in detail but according to col. 2, lines 49-54, the reticulated ceramic portions of the filters may be made from zirconium partially stabilized with MgO or 92% Al<sub>2</sub>O<sub>3</sub> ceramic material. Thus, Morris fails to disclose a bonded network of graphitized carbon. Accordingly, Morris does not remedy the deficiencies of Daussan and Jones.

As Daussan, Morris, and Jones, alone or in any reasonable combination, do not teach or suggest all of the claim limitations, a *prima facie* case of obviousness has not been established. Claim 12 should be in condition for allowance. Claims 13-20 depend from claim 12, and therefore should each be allowed for at least the reasons set forth above.

**Rejections of Claims 22-26 over Jones, Daussan, and Morris**

Claim 22, while not identical to claim 12, recites features similar to claim 12. Applicant briefly reiterates the declaration of Dr. Juma. In the manufacturing of the filter disclosed in Jones, an amorphous matrix of borosilicate is formed in which a crystalline phase comprising graphite and wollastonite is dispersed. Graphite is inert under conditions used in the manufacturing of the filter disclosed in Jones. As explained in detail above and in the declaration, a continuous carbon bonded network of graphitized carbon cannot form. Because the borosilicate glass is always used in a large excess relative to any amorphous carbon present, it is not possible for such amorphous carbon to form a carbon bonded network of graphitized carbon that bonds together the particles of the ceramic powder. Jones describes a filter in which the ceramic particles are bound by a bonding material that is completely different from the carbon bonded network of graphitized carbon as claimed. Thus, claim 22 is not obvious over Jones, Daussan, and Morris for at least for the reasons provided for claim 12 and the reasons discussed herein. Claims 23-26 and 29 depend from claim 22, and therefore should each be allowed for at least the reasons set forth above.

**Rejections of Claims 12-21 over Daussan, Morris, and Bell**

Daussan, Morris, and Bell, alone or in any reasonable combination, do not teach each of the claimed limitations and/or a *prima facie* case of obviousness has been rebutted because Bell teaches away from the claimed invention. Daussan and Morris have been discussed in detail above and apply equally here. In particular, Daussan and Morris fail to disclose a bonded network of graphitized carbon.

Applicant maintains that the '047 Publication to Bell is not a 102(e) reference for the purpose relied on by the Office because the citations used in the Office Action are not supported by the '846 PCT reference. The '047 Publication to Bell is a continuation of Application No. 10/362,751 (issued as Patent No. 7,138,084), which claims priority to International Application PCT/GB01/03846 (the '846 PCT). In particular, the Office has relied

on claims 8-53 of the '047 Publication to Bell. Office Action pg. 8. The Office relies on claim 26 reciting a filter comprising 5-25% graphitized carbon and claim 45 for reciting a semi-damp mixture. Office Action pg. 11. It must be noted that the words "graphitized carbon" appear nowhere in the specification of the '846 PCT Publication; appear nowhere in the text of U.S. Patent No. 7,138,084; and appear only, for the first time, in newly added claims of the '047 Publication, which is an application filed October 20, 2006. This means that the use of the alleged teachings of graphitized carbon by the '047 Publication to reject claims in an application having a priority date of June 3, 2002 is wholly improper.

Moreover, the subject matter of claims 23 through 53 were not part of the PCT application as filed and also were not part of the parent Patent No. 7,138,084. Accordingly, the subject matter of claims 23-53 is only entitled to a priority date of October 20, 2006. Thus, the teaching within these claims is not prior art and cannot be used against claims of the present case.

Notwithstanding the above, Applicant will address the remaining cited portions of the '047 Publication used in the rejection. These allegedly relevant portions of the '047 Publication, however, still fail to disclose graphitized carbon. Further, it fails to disclose or suggest that the graphitized carbon constitutes up to 15 % by weight of the filter.

The Office relies on para. 36 and 39 of the '047 Publication for allegedly teaching the claimed range. Office Action pg. 10. These paragraphs state the following:

The particulate refractory material can, for example, comprise a mixture of graphite and another refractory material (e.g. alumina). For example the graphite content of the refractory particles is preferably from zero to 50 weight %, more preferably from 10 to 40 weight % based on the total weight of the refractory particles, the balance being met by one or more other particulate refractory materials. Pg. 3, para. 0036 of the '047 Publication to Bell.

The relative proportions (in percentage by weight) of the particulate refractory material to binder are preferably in the range at least 50% refractory: no more than 50% binder; more preferably they are in the range at least 55% refractory: no more than 45% binder; even more preferably they are in the range at least 60% refractory: no more than 40% binder, for example approximately 65-75% refractory: approximately 35-25% binder. The binder used in the process of the present invention is preferably a carbon-rich material that provides a good yield of coke when heated to temperatures in

the range of 500 to 700 °C. Pg. 3, para. [0039] of the '047 Publication to Bell.

Applicant recognizes that the '047 Publication to Bell broadly describes a filter comprising particles of refractory material embedded in and bonded together by a carbon matrix material. As explained in Dr. Juma's declaration, however, to obtain sufficient stability during metal casting, a high amount of carbon matrix bonding material of at least 25 wt% is required. Decl. para. 26. Paragraph [0017] of the '047 Publication to Bell, which appears to correspond to paragraph [0039], describes the relative proportions of particulate material to bonding material. The narrowest range is approximately 35 – 25 % of bonding material and approximately 65 – 75 % refractory. These values also correspond to the amounts shown in the Examples of Bell, e.g., 45 to 25 % Rauxolit in Example 1, 40 % of Rauxolit FF in Example 2, etc. See pg. 7, paras. [0099] and [0104] of the '047 Publication. As explained in Dr. Juma's declaration, because the bonding material is formed during firing, other components added to the slurry (e.g., water, organic binder, thickener and suspension agent) will be volatilized during firing such that the relative amount of the bonding material, e.g., Rauxolit, and refractory corresponds to the amounts of bonding material and refractive material present in the filter. Decl. para. 27.

The Office also relies on the following citation in the '047 Publication to Bell:

It is preferred to use a binder containing from 0 to 50 weight %, preferably 0 to 20 wt % (based on total binder) of mesophase in the process of the present invention for making the filter material. Thus, in the present invention the bonding of the refractory particles is preferably achieved with the carbon matrix in the form of semicoke. The semicoke is preferably formed by heating coal tar or pitches, petroleum tar or pitches or synthetic aromatic polymer to cause the formation of at least some so-called "mesophase". The liquid or semi-liquid mesophase coats the surface of the refractory particles, and the mesophase is then converted on firing to form the carbon matrix of semicoke. Pg. 4, para. [0046] of the '047 Publication to Bell.

As stated in the '047 Publication to Bell, the percentage of mesophase refers to a binder used as a starting material and/or it may be developed during firing. See pg. 3, para. [0043] of the '047 Publication to Bell. Mesophase, however, is not equivalent to graphitizable carbon bonding precursor in the sense of the filter as claimed in claim 12. Decl. para. 29. The term "graphitizable carbon bonding precursor" is at best comparable to the term "binder" as used

by the '047 Publication to Bell. Decl. para. 29. As explained above, a filter as described by the '047 Publication therefore contains at least 25 % by weight of graphitizable carbon bonding precursor.

With respect to the addition of the limitation of "fibers" previously set forth in prior claim 21, the '047 Publication to Bell fails to disclose the addition of fibers. As noted above, the addition of the fibers appears to allow the amount of graphitized carbon to be reduced to the lower value of up to 15 wt % and still achieve a high stability of the filter during steel casting. Because the '047 Publication fails to use fibers, a stabilization of the binder material may be required. See discussion at pg. 4, para. [0051] and [0052] of the '047 Publication to Bell describing the tendency of the filter to loose its shape due to the thermoplasticity of the carbon rich material during firing and suitable stabilization techniques, including heat treatment with an oxidizing agent or use of a polyfunctional chemical compound.

As Daussan, Morris, and Bell, alone or in any reasonable combination, do not teach or suggest all of the claim limitations, a *prima facie* case of obviousness has not been established. Even if a *prima facie* case of obviousness was established, it has been rebutted because the '047 Publication to Bell teaches away from the claimed invention requiring at least 25 % by weight of the graphitizable carbon bonding precursor. Accordingly, claim 12 should be in condition for allowance. Claims 13-21 depend from claim 12, and therefore should each be allowed for at least the reasons set forth above.

**Rejections of Claims 22-26 over Bell, Daussan, and Morris**

Claim 22, while not identical to claim 12, recites features similar to claim 12. Thus, claim 22 is not obvious over Daussan, Morris, and Bell for at least the reasons discussed above for claim 12. Claims 23-26 and 29 depend from claim 22, and therefore should each be allowed for at least the reasons set forth above.

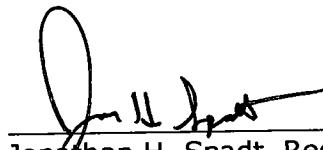
Appln. No.: 10/516,438  
Amendment Dated August 4, 2009  
Reply to Office Action of May 1, 2009

SUD-104US

**Conclusion**

For all of the foregoing reasons, Applicant respectfully requests reconsideration and allowance of the claims. Applicant invites the examiner to contact their undersigned representative if it appears that this may expedite examination.

Respectfully submitted,



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Dated: August 4, 2009

Enclosure: Affidavit of Dr. Kassim Juma

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